Tanta University | Department of Physics & Mathematics | Faculty of Engineering

Course Title: Complex and Special Functions
Date: 2011 (2nd term)

Year: 2nd (comp-)
Allowed time: 3hrs

## Problem number (1) (32) M

(a) show that $1+\cos\theta+\cos 2\theta+\ldots\ldots+\cos n\theta=\frac{1}{2}+\frac{Sm(n+\frac{1}{2})\theta}{2Sm\frac{\theta}{2}}$

(c) Find all values of $\sinh(2+2i)^i$.

(d) If $f(z)=u+iv$ is analytic and $u=consant$ then f`(z)=constant .

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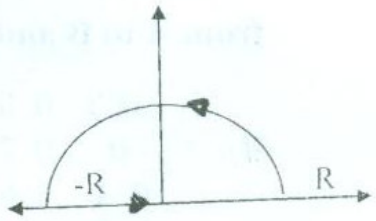
## Problem number (2) (32) M

(a)Evaluate $\int_C \frac{z^3+z+6}{(z-1)(z-4)}dz$ , $C:|z|=3$ .

(b)Evaluate $\int_C \frac{\cosh 3z}{(z-i)^3}dz$ , $C:|z-1|=5$ .

(c)Evaluate

$\int_{-\infty}^{\infty}\frac{\cos 3x}{x^4+4}dx$ On the contour ( $R\to\infty$ )

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## Problem number (3) (49) M

a) Show that

(i) $J_0'''(x) = \frac{J_0(x)}{x}+\left(\frac{2}{x^2}-1\right)J_0'(x)$

(ii) $\beta\left(n+\frac{1}{2},\frac{1}{2}\right)=\frac{(2n)!\ \pi}{2^{2n}\ (n!)^2}$

(b) Evaluate (i) $\int_3^{\infty} e^{6x-x^2}\,dx$

(ii) $\int_0^2 x\ \sqrt[4]{(16-x^4)}\,dx$

(iii) $\int_0^1 x(1-x^2)J_0(kx)dx$

(c) Find Fourier-Bessel Series of

$f(x)=\frac{1}{8}(1-x^2)\quad 0\le x\le 1$ , $J_0(\mu_k x)=0$, $f(x)=\sum_{k=0}^{\infty}A_k\,J_0(\mu_k x)$

With my best wishes

Dr: M.Shokry

**Problem(4)** (37)M

(a) **Define and illustrate with examples:**

**Fuzzy set – The concentration of a fuzzy set .**

(b) **Let A be a fuzzy set defined by**

$A = \frac{0.5}{x_1} + \frac{0.4}{x_2} + \frac{0.7}{x_3} + \frac{0.8}{x_4} + \frac{1}{x_5}$ **. List all $\alpha$-cuts and strong $\alpha$-cuts of A.**

**Find the core of A.**

( c ) **By examples illustrate the following statement: In afuzzy set Operations, the laws of contradiction and excluded middle are not applicable in general .**

(d) **Given P and Q are two relations from A to B and from B to C respectively defined by**

$$M_P = \begin{bmatrix} 0.3 & 0.5 & 0.8 \\ 0 & 0.7 & 1 \\ 0.4 & 0.6 & 0.5 \end{bmatrix}, \quad M_Q = \begin{bmatrix} 0.9 & 0.5 & 0.7 & 0.7 \\ 0.3 & 0.2 & 0 & 0.9 \\ 1 & 0 & 0.5 & 0.5 \end{bmatrix}$$

**calculate** $M_{PoQ}$